ENVIRONMENTAL ASSESSMENT

Cooperative Gypsy Moth Project
For Indiana
2012

By

Indiana Department of Natural Resources
Division of Entomology & Plant Pathology

Indiana Department of Natural Resources
Division of Forestry

United States Department of Agriculture
Forest Service

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1.0 PURPOSE AND NEED FOR ACTION

1.1 Proposed Action

The Indiana Department of Natural Resources (IDNR), Division of Entomology & Plant Pathology and Division of Forestry, proposes a cooperative project with the United States Department of Agriculture (USDA), Forest Service (USFS) to treat the gypsy moth populations at six sites in three counties that cover an estimated 14,272 acres (Table 1 below and maps in Appendix B). The preferred alternative for the cooperative project is Alternative 5: Btk, mating disruption and/or mass trapping.

Table 1. Number of Treatment Sites and Acres by County and Treatment Method for 2012.

COUNTY	TREATMENT SITES By Treatment Method		TREATMENT ACRES By Treatment Method	
	Mating Disruption	Btk Aerial	Mating Disruption	Btk Aerial
Fulton	3	0	4,395	0
Lake	2	0	9,209	0
Porter	0	1	0	668
Proposed Cooperative Project by Treatment	5	1	13,604	668
Total Cooperative Project	6		14, 272	

1.2 Project Objective

The objective of this cooperative project is to slow the spread of the gypsy moth populations by eliminating reproducing populations from the proposed treatment sites. Over the past four years in Indiana, this objective has been successfully met, while implementing the Slow the Spread Program (STS) [see Tobin & Blackburn (2007) and Gypsy Moth Slow the Spread Foundation, Inc., http://www.gmsts.org].

1.3 Need for Action

Gypsy moth (*Lymantria dispar*) is not native to the United States, and it lacks effective natural controls. The caterpillars feed on the foliage of many host plants. Oaks are the preferred host species, but the caterpillars defoliate many species of trees and shrubs when oaks are not available. When high numbers of gypsy moth caterpillars are present, forests and trees suffer severe defoliation, which can result in reduced tree growth, branch dieback and even tree mortality. The high numbers of caterpillars also create a substantial public nuisance and can affect human health.

The State of Indiana, with the IDNR, Division of Entomology and Plant Pathology as the lead agency, is dedicated to preserving urban and rural forested habitats from damage by gypsy moth and to enforcing interstate and intrastate quarantines to further protect areas not currently infested by this pest. If no action is taken, gypsy moth will increase and spread and defoliation will occur sooner. Therefore, the "no action" alternative is not preferred due to the desire of state officials to eliminate the isolated infestations, prevent human discomfort associated with infestations, delay damage to local plant communities and reduce spread to adjacent non-infested areas. Through public involvement, the majority of participating citizens supported the proposed action (Appendix A).

1.4 Decisions to be Made and Responsible Officials

The preferred alternative in this document proposes cooperative participation of the IDNR and the USFS in treatment of gypsy moth populations in Indiana. The decision to be made by the responsible USFS official is to choose which of the alternatives presented in this document best meets the objective of the proposed action, and thus the needs of the people of Indiana. In addition, the decision will have to be made as to whether or not any perceived significant environmental impacts could result from the implementation of this project. If there are none, this will be documented in a Decision Notice and FONSI (Finding of No Significant Impact). If significant environmental impacts are found and the project is to continue, an Environmental Impact Statement (EIS) would be prepared.

The alternatives analyzed for this environmental assessment are:
1) No cooperative project (No action),
2) Btk,
3) Mating disruption,
4) Mass trapping,
5) Btk, mating disruption and/or mass trapping (Preferred Alternative).

The responsible USFS official who will make this decision is:

Barbara Tormoehlen, Field Representative, USDA, Forest Service, State and Private Forestry, Northeastern Area, 1992 Folwell Avenue, St. Paul, MN 55108, (651)-649-5276.

The responsible officials for the implementation of the cooperative project in the Indiana DNR are:

Philip Marshall, State Entomologist, Indiana Department of Natural Resources, Division of Entomology and Plant Pathology, 402 West Washington Street, IGC South, Room W290, Indianapolis, IN 46204, (317) 232-4120.

John Seifert, State Forester, Indiana Department of Natural Resources, Division of Forestry, 402 West Washington Street, IGC South, Room W296, Indianapolis, IN 46204, (317) 232-4105.

1.5 Scope of the Analysis

A final environmental impact statement (FEIS), developed by the USDA, Animal & Plant Health Inspection Service (APHIS) and USFS, entitled Gypsy Moth Management in the United States: a cooperative approach (USDA 1995) was made available in November 1995. The Record of Decision for the FEIS was signed in January of 1996 (USDA 1996), and Alternative 6 was selected, which includes all three management strategies analyzed – suppression, eradication, and slow-the-spread. These strategies depend upon the infestation status of the area: generally infested, uninfested, and transition. Implementation of the FEIS preferred alternative requires that a site-specific environmental analysis be conducted to address local issues before federal or cooperative projects are conducted. This site-specific analysis is tiered to the programmatic environmental impact statement (USDA 1995). As part of the analyses conducted for the FEIS, human health and ecological risk assessments were prepared (Human Health Risk Assessment, Appendix F to the FEIS and Ecological Risk Assessment, Appendix G to the FEIS). The purpose of tiering is to eliminate repetitive discussions of the issues addressed in the FEIS (40 CFR, 1502.20 and 1508.28 in Council on Environmental Quality, 1992).

This environmental assessment provides a site-specific analysis of the alternatives and environmental impacts of treating gypsy moth populations for the Transition Area in Indiana.

1.6 Summary of Public Involvement and Notification

A total of four public meetings were held during January and February of 2012 with a total attendance of 59 individuals. (Appendix A). The public involvement notification process involved a combination of methods, including mailings, press releases, website postings, Twitter postings, legal notices and phone calls. A postcard notice of the public meetings was delivered to residents living in and adjacent to the proposed treatment sites. A notification letter of the public meetings was also delivered to public officials. At each meeting, state officials presented alternatives for gypsy moth management. The discussion included identification and biology of gypsy moth, pest impacts, survey methods, and treatment options. The proposed action and alternatives, including no action, were discussed. Local issues, questions and concerns stated at the public meetings and in subsequent phone calls, letters and emails are included in Appendix A.

Information gathered from the public and from resource professionals was used to develop issues and concerns related to the project. They are grouped into two categories; 1) issues used to formulate alternatives, and 2) other issues and concerns.

1.7 Issues Used to Formulate the Alternatives

Each of the major issues is introduced in this section. Discussion pertaining directly to each issue as it relates to the alternatives can be found in Chapter 4.

Issue 1 - Human Health and Safety. Three types of risk are addressed under this issue: 1) an aircraft accident during applications, 2) treatment materials and potential effects on people, and 3) the future effects of gypsy moth infestations on people.

Issue 2 - **Effects on Nontarget Organisms and Environmental Quality.** The major concerns under this issue are: 1) the impact of treatment materials to nontarget organisms, including threatened and endangered species that may be in the treatment sites, and 2) the future impacts of gypsy moth defoliation on the forest resources, water quality, wildlife and other natural resources.

Issue 3 - **Economic and Political Impacts of Treatment vs. Non-Treatment.** Gypsy moth outbreaks can have significant economic impacts due to effects on the timber resource, nursery and Christmas tree producers, and recreational activities. An additional economic impact is a gypsy moth quarantine imposed to regulate movement of products from the forest, nursery and recreational industries to uninfested areas.

Issue 4 - **Likelihood of Success of the Project.** The objective of this cooperative project is to slow the spread of the gypsy moth populations by eliminating reproducing populations from the proposed treatment sites. Alternatives vary in their likelihood of success for the current situation in Indiana. Measurement of project success is important for delaying gypsy moth impacts to Indiana and neighboring states.

1.8 Other Concerns and Questions

Concerns and questions were discussed during the public meetings (see Appendix A). Also, other agencies were consulted (see Appendix C). Information from these sources was used to develop management guidelines, treatment constraints, and mitigating measures.

1.9 Summary of Authorizing Laws and Policies

State. The Division Director (State Entomologist) may cooperate with a person in Indiana to locate, check, or eradicate a pest or pathogen (Indiana Code 14-24-2-1). The Division Director may, on the behalf of the department, enter into a cooperative agreement with the United States government, the government of another state, or an agency of the United States or another state to carry out this article (Indiana Code 14-24-2-2).

Aerial applicators must meet Indiana Pesticide Use and Application Law (Indiana Code 15-3-3.6) to provide safe, efficient and acceptable applications of pesticides. This project will be conducted in accordance with the National Pollutant Discharge Elimination System (NPDES) requirements and is operating under Indiana Pesticide General Permit ING870000.

The Non-Game and Endangered Species Conservation law (Indiana Code 14-22-34) applies to this project.

Federal. Authorization to conduct treatments for gypsy moth infestations is given in the Plant Protection Act of 2000 (7 U.S.C. section 7701 et.seq.).

The Cooperative Forestry Assistance Act of 1978 provides the authority for the USDA and state cooperation in management of forest insects and diseases. The law recognizes that the nation's capacity to produce renewable forest resources is significantly dependent on non-federal

forestland. The 2008 Farm Bill (P.L. 110-246) reauthorizes the basic charter of the Cooperative Forestry Assistance Act of 1978.

The National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190), 42 USC 4321 et. seq. requires a detailed environmental analysis of any proposed federal action that may affect the human environment. The courts regard federally funded state actions as federal actions.

The Federal Insecticide, Fungicide and Rodenticide Act of 1947, (7 USC 136) as amended, known as FIFRA, requires insecticides used within the United States be registered by the United States Environmental Protection Agency (EPA).

Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 et. seq.) prohibits federal actions from jeopardizing the continued existence of federally listed threatened or endangered species or adversely affecting critical habitat of such species.

Section 106 of the National Historical Preservation Act and 36 CFR Part 800: Protection of Historic Properties requires the State Historic Preservation Officer be consulted regarding the proposed activities.

USDA Departmental Gypsy Moth Policy (USDA 1990) assigns the USFS and APHIS responsibility to assist states in protecting non-federal lands from gypsy moth damage.

Executive Order #12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires that actions taken by Federal agencies will not result in disproportionately high and adverse human health or environmental effects on any minority or low-income populations.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Process Used to Formulate the Alternatives

Staff entomologists and administration within the IDNR, Division of Entomology and Plant Pathology and the Division of Forestry in cooperation with the USFS, formulated several alternatives to treat the gypsy moth populations in Indiana under the slow-the-spread strategies (See Chapter 6, Persons and Agencies Consulted).

The FEIS (USDA 1995), which this document is tiered to, allows the USDA to participate in the Cooperative Gypsy Moth Project for Indiana. The USDA can assist in conducting eradication, slow-the-spread and suppression strategies. The FEIS lists the treatment options for each of the strategies (USDA 1995, Vol. II, p.2-15). For the slow-the-spread strategy, the following six treatment options may be considered: 1) *Bacillus thuringiensis* var. *kurstaki (*Btk), 2) diflubenzuron (Dimilin), 3) nucleopolyhedrosis virus (Gypchek), 4) mass trapping, 5) mating disruption, and 6) sterile insect release. These treatment options from the FEIS were used as the alternatives for the site-specific analysis of this Environmental Assessment.

2.2 Alternatives Eliminated from Detailed Study

The following alternatives that are available were eliminated from consideration:

Diflubenzuron (Dimilin). The label for diflubenzuron (Dimilin) prohibits its use over wetlands and directly to water. Treatment sites contain ponds, lakes, marsh, rivers and/or wetlands. Therefore, Dimilin is not considered for this project. In future projects, it may be evaluated for use.

Gypsy moth specific nucleopolyhedrosis virus (Gypchek). Gypsy moth nucleopolyhedrosis virus (Gypchek) has a very limited supply and is targeted for use in special areas that have high environmental concerns (e.g., treatment sites that have threatened or endangered species, which could be impacted by other treatment options). There is limited data on the effectiveness of Gypchek in low level gypsy moth populations. It is preferably used in suppression projects against moderate to high gypsy moth populations (USDA 1995, Vol. II, p. A7). Therefore, Gypchek is not considered for this project. In future projects, it may be evaluated for use.

Sterile insect release. The FEIS documents the use of sterile insects for elimination of isolated gypsy moth populations. It also documents the obstacles of using this alternative - the limited release period; need to synchronize production of sterile pupae and release into the population; and the limited availability. This treatment alternative is currently not available, and it has not been used in recent eradication or slow-the-spread treatment projects. Giving consideration to these obstacles, Sterile insect release is not considered for this project. In future projects, it may be evaluated for use.

2.3 Alternatives Considered in Detail

Alternative 1 - **No action.** If no action is taken, the gypsy moth will reproduce and populations will begin to defoliate trees in the area. Gypsy moth populations will develop and spread to surrounding areas. This is not a preferred alternative because damage and regulatory action will occur sooner than if other alternatives are selected.

Alternative 2 - **Btk.** This treatment option uses one or two applications of Btk at 24 to 38 billion international units (BIU) per acre applied from air or ground. The applications would begin when leaf expansion is near 50% and when first and second instar caterpillars are present and feeding. This usually occurs between late April and late May in northern Indiana. The second application would follow no sooner than four days after the first application. Most commercial formulations of Btk are aqueous flowable suspension containing 48 or 76 BIU per gallon (Appendix D – Product Labels). For aerial application at 24 to 38 BIU, less than 3.0 quarts of the product would be applied per acre.

Btk has been a commonly used treatment option in Cooperative Gypsy Moth Projects in Indiana and other states. Btk is a naturally occurring soil-borne bacterium that is mass-produced and formulated into a commercial insecticide. The Btk strain is effective against caterpillars, including the gypsy moth caterpillar. Caterpillars ingest Btk while eating the foliage. Once in the midgut, Btk becomes active and causes death within a few hours or days (USDA 1995, Vol. II, p. A3-A5). Btk may impact nontarget species of spring-feeding caterpillars in the treatment sites, but the impact to the local population is usually very minimal as Btk rapidly degrades on the foliage within a few weeks, and the nontarget lepidopterans generally re-colonize treatment sites in less than 2 years (USDA 1995, Vol. II, p. 4-52 to 4-55). Human exposure to Btk provides little cause for concern, though direct exposure to the spray may cause temporary eye and respiratory tract irritation in a few people (USDA 1995, Vol. II, p. 4-13).

Btk has proven effective at eliminating or reducing gypsy moth at all levels of population. Thus, Btk applications can meet the project objective of slowing the rate of spread of gypsy moth at all of the proposed treatment sites.

Alternative 3 - **Mating disruption.** This treatment option uses one aerial application of pheromone flakes or SPLAT (Specialized Pheromone and Lure Application Technology) GM with the active ingredient, disparlure, prior to the emergence of male moths. This would occur in mid-June to early July. Mating disruption relies on the attractive characteristics of disparlure, the gypsy moth sex pheromone. The objective of mating disruption is to saturate the treatment area with enough pheromone sources to confuse the male moths and prevent them from finding and mating with female moths. Mating disruption is considered specific to gypsy moth and is not known to cause impacts to nontarget organism populations, water quality, microclimate, or soil productivity and fertility (USDA 1995, Vol. II, p. 4-67).

Mating disruption using pheromone flakes involves the aerial application of plastic flake dispensers that are infused with the gypsy moth pheromone. The formulation of Disrupt II (see Appendix D – Product Labels) consists of small plastic flakes, approximately 1/32 inch x 3/32 inch (1 x 3 mm) in size, thus the name “pheromone flakes”. A sticker, Micro-Tac, produced by

Hercon is applied to the flakes as they are dispersed from the aircraft, which aids in the distribution of the flakes throughout all levels in the forest canopy where mating could potentially occur. The flakes are green in color and applied at a rate of 6 or 15 grams active ingredient (disparlure) per acre. At the high rate of 15 grams, 85 grams of flakes (2 flakes per square foot) are applied with 2 fluid ounces of sticker per acre. All of the ingredients in the Micro-Tac sticker are considered non-hazardous to public health when used as an additive in the insecticide formulation (40 CFR 180.1001).

Mating disruption using SPLAT GM involves the aerial application of amorphous polymer matrix droplets that are infused with the gypsy moth pheromone. The formulation of SPLAT GM consists of small waxy droplets, approximately 0.3 mm to 2.0 mm in size when released from a conventional aerial application system. The droplets are a grayish white in color and applied at a rate of 3 grams to 30 grams of active ingredient (disparlure) per acre (see Appendix D – Product Labels). Applications would most commonly be applied at a rate of either 6 or 15 grams (equivalent of approximately 1.2 teaspoons or 3.0 teaspoons) of pheromone per acre. All of the matrix ingredients are cleared as food safe by the FDA and are biodegradable.

Mating disruption has proven effective at eliminating or reducing gypsy moth at very low population levels for sites greater than 40 acres, and can meet the project objective of slowing the rate of spread of gypsy moth at five of the proposed treatment sites.

Alternative 4 - **Mass trapping.** This treatment option places gypsy moth traps at a close spacing within the treatment sites. "The objective of this treatment is to capture male gypsy moths before they have a chance to locate and mate with female moths." (USDA 1995, Vol. II, p. A-7). "For mass trapping, delta or milk carton traps are deployed in an intensive grid pattern in an infested area and an adjacent buffer area at the rate of at least nine traps per acre" (USDA 1995, Vol. II, p. A-8). Thus, it is very labor intensive, especially over large areas. Typically, mass trapping is used on small infestations of less than 40 acres.

Mass trapping has proven capable of eliminating or reducing gypsy moth at very low population levels in isolated introductions for sites less than 40 acres. The use of mass trapping can meet the project objective of slowing the rate of spread of gypsy moth at small treatment sites.

Alternative 5 - **Btk, Mating disruption and/or Mass trapping (Preferred Alternative)**. The use of this alternative provides flexibility to select Btk, mating disruption, or mass trapping alone or in combination for each site based on the following criteria: 1) gypsy moth population level, 2) habitat type (urban, rural, open water or wetland), 3) nontarget organisms, 4) safety and 5) cost and project efficiency. The use of this alternative can meet the objective of slowing the spread of gypsy moth at all of the proposed treatment sites.

2.4 Comparative Summary of Alternatives

Table 2. Summary of Environmental Consequences for Alternatives by Issues from Chapter 4.

	Issue 1 Human Health & Safety (pgs. 13-14)	**Issue 2** Effects on Nontarget Organisms & Environmental Quality (pgs. 14-16)	**Issue 3** Economic and Political Impacts (pgs. 16-17)	**Issue 4** Likelihood of Success of the Project (pg. 17)
Alternative 1 No action	- No risk of an aircraft accident or spill. - No risk of Btk contact with humans. - Gypsy moth outbreaks will occur sooner along with the associated nuisance and health impacts to humans.	- No direct effect to nontarget organisms, including threatened and endangered species. - Future gypsy moth impacts will occur sooner, which includes defoliation and reduction in the oak component of forest stands.	- Regulatory action would occur sooner. - Spread of gypsy moth through these counties and into adjacent counties would not be slowed. - Suppression projects and negative financial impacts from defoliation would occur sooner.	- The spread of gypsy moth would not be slowed at the treatment sites and the project objective would not be met.
Alternative 2 Btk	- Slight risk of aircraft accident and pesticide spill. - Contact with Btk may cause mild and temporary irritation (eye, skin & respiratory) to a few people. - Delay effect of gypsy moth outbreaks on humans.	- Direct impact on spring feeding caterpillars, temporary reduction in local populations. - No effect on Karner blue butterfly and Mitchell's satyr as neither species is known to occur in close proximity to proposed treatment sites. - No impact on Indiana bat, clubshell mussel, and copperbelly water snake. - Delay the impact of gypsy moth defoliation on environmental quality.	- Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth.	- Success is likely in the treatment sites.
Alternative 3 Mating disruption	- Slight risk of aircraft accident. - No effect to human health. - Delay effect of gypsy moth outbreaks on humans.	- No effect to nontarget organisms, including threatened and endangered species known to occur within the site - Delay the impact of gypsy moth defoliation on environmental quality.	- Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth.	- Success is likely in treatment sites with very low populations.
Alternative 4 Mass trapping	- No risk of aircraft accident or spill. - No risk of Btk contact with humans - No effect to human health - Delay effects of gypsy moth outbreaks on humans.	- No effect to nontarget organism including, threatened and endangered species known to occur within the site. - Delay the impact of gypsy moth defoliation on environmental quality.	- Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth. - Cost is prohibitive in large treatment sites.	- Success is likely in treatment sites with very low populations.
Alternative 5 Btk, Mating disruption and mass trapping	- Same as alternative 2, 3 or 4 depending on the treatment at each site.	- Same as alternative 2, 3 or 4 depending on the treatment at each site.	- Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth.	- Success is likely in the treatment sites.

3.0 AFFECTED ENVIRONMENT

3.1 Description of the Proposed Treatment Sites

Fulton County: This county is about 235,770 acres and 4,395 acres are in the proposed treatment sites. Thus a small portion of the county is proposed for treatment. Within the treatment sites, the tree canopy is estimated to be 38% of the treatment sites and is the target for treatment.

Rochester North: The proposed treatment site contains 863 acres. The site is composed of trees associated with rural residences and woodlots. Cherry, oak, ash, cottonwood, maple, elm, walnut and other hardwoods and shrubs are present. A conservation planting of white pine occurs within the site. Houses occur within the site. Menominee State Public Fishing Area occurs within the site. The Tippecanoe River runs through the northern portion of the site. Blair Ditch, McMahan Ditch, Kelley Ditch, associated wetlands and a few ponds occur within the site. No towers occur within the site. The Fulton County Airport (RCR), which includes a helipad, is two miles southwest of the site. This site was detected in 2011 and has had no prior treatment. No egg masses were detected in this site in 2011. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Rochester NW: The proposed treatment site contains 1,316 acres. The site is composed of trees associated with rural residences and woodlots. Cherry, oak, cottonwood, maple, elm, walnut and other hardwoods and shrubs are present. Conservation plantings of white pine occur within the site. Houses and businesses occur within the site. An abandoned county landfill in the process of being converted into a park and police shooting range occurs within the site. Geneva Center, a Presbyterian Summer Camp and Retreat Center, occurs within the northwest area of the site. Ponds and small wetlands areas occur within the site. An unnamed ditch leading to the Tippecanoe River (outside of the site) occurs in the southern portion of the site. One tower occurs within the site, and several towers occur within a half mile of the site. The Fulton county Airport (RCR), which includes a helipad, is four miles southwest of the site. The site was detected in 2011 and has had no prior treatment. No egg masses were detected in this site in 2011. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Rochester South: The proposed treatment site contains 2,216 acres. The site is composed of trees associated with both rural and urban residences and woodlots. Cherry, oak, cottonwood, maple, elm, walnut and other hardwoods and shrubs are present. Houses, businesses, churches, a public library, a community center and Rochester Community High School/Middle School occur within the site. Rochester City Park occurs within the site. Cessna Ditch, Minnow Ditch and a few ponds occur within the site. Two cell towers and power lines occur within the site. A water tower occurs adjacent to the site. The Fulton County Airport (RCR), which includes a helipad, is 1.5 miles east of the site. The site was detected in 2011 and has had no prior treatment. No

egg masses were detected in this site in 2011. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Lake County: This county is about 317,990 acres and 9,209 acres are in the proposed treatment sites. Thus a small portion of the county is proposed for treatment. Within the treatment sites, the tree canopy is estimated to be 66% of the treatments sites and is the target for treatment.

Briar Ridge: The proposed treatment site contains 1,637 acres. The site is composed of trees associated with urban residences and woodlots. Oak, maple, crabapple, hawthorn, spruce and other hardwoods and shrubs are present. Houses and businesses occur within the site. Briar Ridge Country Club and Golf Course, Briar Creek Park and Plum Creek Park occur within the site. Ponds, creeks and Dyer Ditch occur within the site. Power lines occur within the site. No towers occur within the site. Conrail Railroad occurs northwest to southeast through the site. The site was detected in 2010 and delimited in 2011. Part of the site was treated with Btk in 2011. No egg masses were detected in this site in 2011. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Oak Savannah: The proposed treatment site contains 7,572 acres. The site is composed of trees associated with both urban and rural residences and woodlots. White oak, maple, crabapples, other oak species, cottonwood and other hardwoods and shrubs are present. Houses, businesses, schools, and churches occur within the site. Mundell Field, Lakeview Park, Festival Park and other parks occur within the site. Cressmoor Country Club and Cressmoor Prairie State Nature Park occur in the northwest portion of the site. Lake George, Deep River, Duck Creek, Turkey Creek and ponds occur within the site. Hobart Sky Ranch, a small airport, occurs in the northern portion of the site. Cell towers, a water tower, and power lines occur within the site. The site was detected in 2009 and was delimited in 2010 and 2011. Part of the site was treated with mating disruption in 2010. No egg masses were detected in this site in 2011. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Porter County: This county is about 267,639 acres and 668 acres are in the proposed treatment sites. Thus a small portion of the county is proposed for treatment. Within the treatment site, the tree canopy is estimated to be 34% of the treatment site and is the target for treatment.

Cobbs Corner: The proposed treatment site contains 668 acres. The site is composed of trees associated with rural residences and woodlots. White oak, red oak, maple and other hardwoods and shrubs are present. Houses and businesses occur within the site. A few ponds occur within the site. The site was detected in 2003 and delimited in 2004 through 2007. Part of the site was treated with Btk in 2004, 2005 and 2006. Part of the site was treated with mating disruption in 2007. In total, less than 40 acres was treated with Btk in consecutive years from 2004 to 2006. Several egg masses were detected in this site in 2011. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

3.2 Threatened and Endangered Species

Consultation with the staff of the U.S. Fish and Wildlife Service determined that, "Spraying with Bacillus thuringiensis (Bt) is of concern for 2 federally endangered species of Lepidoptera in Indiana, the Karner blue butterfly (*Lycaeides melissa samuelis*) and Mitchell's satyr butterfly (*Neonympha mitchellii*). The occurrences and ranges of these species have not changed since our previous reviews of the gypsy moth program. Neither species is known to occur near any of the 2012 treatment sites. Treatment with Disrupt II pheromone flakes is considered to be highly specific for gypsy moths and is not known to have adverse impacts on the federally listed butterflies."(Appendix C – Letter from U.S. Fish & Wildlife Service).

The U.S. Fish and Wildlife Service also evaluated the proposed sites for other endangered and threatened species. It was determined that the proposed treatments would not have an impact on the Indiana bat (*Myotis sodalis*), clubshell mussel (*Pleurobema clava*), and copperbelly water snake (*Nerodia erythrogaster neglecta*). (Appendix C – Letter from U.S. Fish & Wildlife Service).

"The FWS concludes that the federally assisted 2012 gypsy moth program is not likely to adversely affect any of these federally listed species."(Appendix C – Letter from U.S. Fish & Wildlife Service).

The IDNR, Environmental Unit reviewed the project and determined, "At this time, no harm to state or federal listed species resulting from the proposed control measures is known or anticipated." (Appendix C – Letter from IDNR Div. of Fish and Wildlife, Early Coordination/Environmental Assessment).

3.3 Protection of Historic Properties

The State Historic Preservation Officer did not identify any historic properties that will be altered, demolished, or removed by the proposed project pursuant to Indiana Code 14-21-1. (Appendix C –Letter from IDNR, Division of Historic Preservation and Archaeology).

4.0 ENVIRONMENTAL CONSEQUENCES

This section is the scientific and analytic basis for the comparison of alternatives. It describes the probable consequences (effects) of each alternative for each issue. Environmental consequences are summarized in Table 2 for each combination of the alternatives and issues.

4.1 Human Health and Safety (Issue 1).

Alternative 1 – No action. For this alternative, there would be no cooperative project, therefore risk of human contact with mating disruption or Btk and an aircraft accident during application would not exist. However, future impacts by gypsy moth to human health will occur sooner under Alternative 1 than if treatments are used to slow-the-spread of these gypsy moth populations. Gypsy moth outbreaks have been associated with adverse human health effects, including skin lesions, eye irritation, and respiratory reactions. Gypsy moth caterpillars can become a serious nuisance that can cause psychological stress in some individuals (USDA 1995, Vol. II, p. 4-9).

Alternative 2 - Btk. Human exposure to Btk provides little cause for concern about health effects. "On the basis of both the available epidemiology studies as well as the long history of use, no hazard has been identified for members of the general public exposed to Btk formulations" (USDA 1995, Vol. III, p. 4-15). Exposure to Btk may result in temporary eye, skin, and respiratory tract irritation in a few people. A detailed analysis of the risks posed to humans by Btk was conducted for the FEIS -- Human Health Risk Assessment (USDA 1995, Vol. III). Glare and O'Callaghan provide a comprehensive review of *Bacillus thuringiensis*, including Btk. They conclude with this statement, "After covering this vast amount of literature, our view is a qualified verdict of safe to use." (Glare and O'Callaghan, 2000)

A slight risk of an accident always exists when conducting aerial applications. Btk uses one or two applications. To further reduce this risk, a detailed work and safety plan is required prior to program implementation, which outlines guidelines for aircraft inspections, Btk loading, and conditions for safe applications.

The effect of gypsy moth outbreaks on humans would be delayed using this alternative.

Alternative 3 – Mating disruption. The toxicity of insect pheromones to mammals is relatively low and their activity is target-specific. Therefore the EPA requires less rigorous testing of these products than of conventional insecticides. Risk to human health due to exposure to disparlure, the active ingredient used in mating disruption applications, is discussed in the FEIS (USDA 1995, Vol. II, pp. 4-30 to 4-32). Once absorbed through direct contact, disparlure is very persistent in humans, and individuals exposed to disparlure may attract adult male moths for prolonged periods of time. This persistence is viewed as a nuisance and not a health risk (USDA 1995, Vol. III, 8-1). In acute toxicity tests, disparlure was not toxic to mammals, birds, or fish (USDA 1995, Vol. IV, 5-5) therefore no effects to human health are anticipated.

A slight risk of an accident always exists when conducting aerial applications – mating disruption uses one application. To further reduce this risk, a detailed work and safety plan is

required prior to program implementation, which outlines guidelines for aircraft inspections, product loading, and conditions for safe applications.

The effect of gypsy moth outbreaks on humans would be delayed using this alternative.

Alternative 4 – Mass trapping. The effect of gypsy moth outbreaks on humans would be delayed using this alternative. The human health effects are not anticipated from the use of disparlure in the delta traps (see Alternative 3 above).

Alternative 5 – Btk, Mating disruption, and Mass trapping. The human health and safety consequences stated above for Alternatives 2, 3 and 4 apply to this alternative.

4.2 Effects on Nontarget Organisms and Environmental Quality (Issue 2).

Alternative 1 – No action. With no treatments in the current year, future impacts by the gypsy moth would occur sooner. Defoliation by the gypsy moth will cause selective mortality of preferred host trees. During outbreaks, forest ecosystems can change due to a reduction of the oak component and an increase of tree species that are less desired by gypsy moth, such as maple and ash. Oak forests would likely consist of a more mixed composition in the future; though oak would still be a component.

Gypsy moth defoliation and subsequent tree mortality can affect nontarget organisms by dramatically changing habitats on a local scale. Heavy defoliation can remove food for other leaf-feeding species, including other caterpillars. However, it can also create new habitat for some species by creating snags and increasing understory plant development by increasing light penetration into defoliated areas. Impacts on a larger scale (national, regional, or state) are subtle, gradual, and may be noticeable only after many years or decades (USDA 1995, Vol. II, p. 4-74). Short and long term changes in nontarget species have been shown for moderate and heavy defoliation (USDA 1995, Vol. II, p. 4-47 and 4-50). An Ecological Risk Assessment (USDA 1995, Vol. IV) examined gypsy moth impacts on a wide variety of species (mammals, birds, reptiles, amphibians, fish, insects, mollusks, crustaceans, and other invertebrates). Further discussion of gypsy moth and its impact on forest conditions can be found in the FEIS (USDA 1995, Vol. II, p. 4- 41 and 4-74).

Alternative 2 - Btk. Btk can have direct and indirect effects on nontarget organisms. Direct toxicity of Btk is generally limited to the larval stage of moth and butterfly species. Btk is not toxic to vertebrates, honeybees, parasitic and predatory insects, and most aquatic invertebrates (USDA 1995, Vol. IV, p. 5-1). Btk has a direct adverse effect on caterpillars of moths and butterflies, but susceptibility varies widely among species. Btk, as used in gypsy moth projects, poses a risk to some spring-feeding caterpillars; however, permanent changes in their populations do not appear likely. An exception may occur in certain habitats that support small isolated populations of a particular species of moth or butterfly that is highly susceptible to Btk (USDA 1995, Vol. II, p. 4-54). The U.S. Fish and Wildlife Service identified two federally endangered butterflies of concern, Karner blue butterfly (*Lycaeides melissa samuelis*) and the Mitchell's satyr butterfly *(Neonympha mitchellii*). "Neither species is known to occur near any of the 2012 treatment sites." (Appendix C – Letter from U.S. Fish & Wildlife Service).

Btk may have an indirect effect on other organisms by a reduction in their food resource (e.g. caterpillars, pupae, or adult moths and butterflies). Any effects on vertebrates due to reduction in food availability are probably subtle, especially for mammals and birds that are very mobile. Populations of some gypsy moth parasites and some general lepidopteran parasites may be reduced, due to the reduction in number of potential hosts caused by the Btk spray (USDA 1995, Vol. IV, p. 5-7).

The U.S. Fish and Wildlife Service also evaluated the proposed sites for other endangered and threatened species. It was determined that the proposed treatments would not have an impact on the Indiana bat (*Myotis sodalis*), clubshell mussel (*Pleurobema clava*), and copperbelly water snake (*Nerodia erythrogaster neglecta*). (Appendix C – Letter from U.S. Fish & Wildlife Service).

"The FWS concludes that the federally assisted 2012 gypsy moth program is not likely to adversely affect any of these federally listed species." (Appendix C – Letter from U.S. Fish & Wildlife Service).

Applications of Btk formulations do not increase levels of Btk in soil, and Btk persists for a relatively short time in the environment. Changes in soil productivity and fertility are not likely in the treatment sites, because Btk occurs naturally in soils worldwide. Additional information concerning the effects to soil can be found in Appendix G of the FEIS (USDA 1995, Vol. IV).

Application of Btk is likely to maintain the forest condition in the short term by eliminating or reducing gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long term, gypsy moth will become well established in these counties; even if this alternative is implemented.

Alternative 3 – Mating disruption. The pheromone, disparlure, is highly specific to gypsy moth, and it will not affect other insects, including any threatened and endangered species of butterflies or moths.

A quantitative assessment of risk from mating disruption was not conducted for the FEIS because disparlure has a low toxicity to vertebrates and specificity to gypsy moth. As used in mating disruption, disparlure is not likely to impact nontarget organisms (USDA 1995, Vol. II, p. 4-67). The toxicity of insect pheromones to mammals is relatively low. In acute toxicity tests, disparlure was not toxic to mammals, birds, or fish (USDA 1995, Vol. IV, 5-5). At normal application rates, concentration of the pheromone (disparlure) in the mating disruption products remains active only for that season. Therefore, no effects on nontarget organisms are anticipated from the proposed mating disruption application.

"The FWS concludes that the federally assisted 2012 gypsy moth program is not likely to adversely affect any of these federally listed species." (Appendix C – Letter from U.S. Fish & Wildlife Service).

Using mating disruption is likely to maintain the forest condition in the short term by eliminating or reducing gypsy moth populations in the treatment sites, thus delaying gypsy moth from

expanding and causing defoliation. In the long term, gypsy moth will become well established in these counties; even if this alternative is implemented.

Alternative 4 - Mass trapping. The pheromone in the delta trap is highly specific to gypsy moth and will not have an effect on other insects or threatened and endangered species of butterflies or moths. "Mass trapping does not affect nontarget organisms, except those (primarily flying insects) that accidentally find their way into the trap." (USDA 1995, Vol. II, p. A-9)

Mass trapping is likely to maintain the forest condition in the short term by eliminating or reducing gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long term, gypsy moth will become well established in these counties; even if this alternative is implemented.

Alternative 5 - Btk, Mating disruption, and Mass trapping. The nontarget and environmental consequences stated above for Alternatives 2, 3 and 4 apply to this alternative.

4.3 Economic and Political Impacts of Treatment vs. Non-Treatment (Issue 3).

Alternative 1 – No action. If no treatments were applied, the likely action would be to implement a quarantine in these counties during the next year. A quarantine would regulate movement of firewood, logs, other timber products, mobile homes, recreational vehicles, trees, shrubs, Christmas trees, and outdoor household articles. This would create a financial impact to industries that deal with these products.

If current populations are not treated, they will continue to reproduce and grow in size. Defoliation would become noticeable in the future, but it would be difficult to predict exactly when noticeable defoliation would occur. Requests for federal assistance to suppress gypsy moth would be likely when defoliation occurs. Suppression projects are generally more expensive in total dollars than eradication projects because much larger areas are treated. The economic impact to state budgets would increase, as responsible agencies would need to administer and fund these suppression projects.

Following defoliation, negative financial impacts are likely to occur for recreational industries such as resorts and campgrounds. Homeowners, private woodland owners, and forest based industries could be impacted by gypsy moth treatment costs, tree mortality, and adverse human health effects.

Alternative 4 – Mass trapping. If treatments are applied, regulatory action is not likely for these counties during the next year and the impacts listed under Alternative 1 would be delayed. Mass trapping is typically used in small areas (less than 40 acres) because it is labor intensive (USDA 1995, Vol. II, p. A8-9). At a rate of approximately $180.00 per acre, its use for all treatment sites would be cost prohibitive (versus approximately only $20.00-$40.00 per acre for Btk or approximately $8.00-$15.00 per acre for mating disruption).

Alternatives 2 (Btk), 3 (Mating disruption), and **5 (Btk, Mating disruption, and Mass trapping).** If treatments are applied, regulatory action is not likely for these counties during the next year and the impacts listed under Alternative 1 would be delayed. Economic analysis from the Slow-The-Spread Program (STS) demonstrated the use of Btk, mating disruption and other STS technology reduced the spread of gypsy moth by as much as 60 percent (Sharov et al. 2002, p. 32). Assessment of the economic feasibility of STS shows that over a 20 year period, the Benefit-Cost Ratio is 2.5, under conservative assumptions (Sills 2007). Economic analysis for this site-specific assessment shows the Benefit-Cost Ratio is 26.8.

4.4 Likelihood of Success of the Project (Issue 4).

Alternative 1 – No action. Project objectives would not be met with this alternative. Gypsy moth would not be eliminated at any level from the treatment sites, and its population would serve as a source for increased spread within the counties and into surrounding counties. If these populations were allowed to increase and expand, gypsy moth could spread through the state in 10 years (Sharov et al. 2002).

Alternative 2 - Btk. Project success is likely with this alternative. Btk has proven effective at eliminating or reducing gypsy moth at all levels of population.

Alternative 3 – Mating disruption. Project success is likely with this alternative in five treatment sites with very low gypsy moth populations. However, one site has gypsy moth populations above the recommended level for treatment with mating disruption.

Alternative 4 – Mass trapping. Mass trapping can be successful in treatment sites with very low gypsy moth populations. However, mass trapping is a labor-intensive treatment and sites greater than 40 acres are usually not mass trapped due to cost.

Alternative 5 - Btk, Mating disruption, and Mass trapping. Project success is optimized with this alternative when treatment selection criteria are used to determine the use of Btk, mating disruption or mass trapping alone or in combination for each site. From the data analysis by the STS Program, the average rate of spread in Indiana during 2008-2011 was calculated to be 2.3 miles per year, which is below the target of 4.8 miles/year by the Slow the Spread Program (STS). Treatment selection criteria used to evaluate each site are: 1) gypsy moth population level, 2) habitat type (urban, rural, open water or wetland), 3) nontarget organisms, 4) safety, and 5) cost and project efficiency.

4.5 Unavoidable Adverse Effects

No unavoidable adverse effects were identified for the proposed project.

4.6 Irreversible and Irretrievable Commitments of Resources

An irreversible commitment of resources results in the permanent loss of: 1) nonrenewable resources, such as minerals or cultural resources; 2) resources that are renewable only over long periods of time, such as soil productivity; or 3) a species (extinction) (USDA 1995, Vol. II, p.

4-93). Except for Alternative 1, there is an irreversible commitment of labor, fossil fuel, and money spent on the project.

An irretrievable commitment is one in which a resource product or use is lost for a period of time while managing for another (USDA 1995, Vol. II, p. 4-93). For this project, no irretrievable commitments were identified.

4.7 Cumulative Effects

No cumulative effects were identified for this proposed project. Cumulative effects are the incremental impacts of the action when added to past, present, and reasonably foreseeable future actions, which are collectively significant. Two of the six proposed sites for treatment in 2012 had treatment in the past 4 years (See Table 3). None of the proposed sites have had Btk treatments for the past three consecutive years.

Table 3. Summary of Treatment History of 2012 Proposed Treatment Sites by Year and Treatment Method*.

County	2012 Site Name	Site Treatment History **				2012 Proposed Treatment
		2008	2009	2010	2011	
Fulton	Rochester North	--	--	--	--	MD
Fulton	Rochester NW	--	--	--	--	MD
Fulton	Rochester South	--	--	--	--	MD
Lake	Briar Ridge	--	--	--	Btk	MD
Lake	Oak Savannah	--	--	MD	--	MD
Porter	Cobbs Corner	--	--	--	--	Btk

Treatment method: Btk = *Bacillus thuringiensis* var. *kurstaki*
MD = Mating disruption

** Indicates previous treatment where there was partial overlap with the 2012 proposed treatment site.

4.8 Other Information

Mitigation

The Cooperative Gypsy Moth Project will implement the following safeguards and mitigations:

- News releases of treatments and dates will be given to local newspapers and radio/TV stations.
- Implementation of a Work and Safety Plan.
- Local safety authority will be notified by direct contact or phone calls.
- Prior to treatments, IDNR staff will communicate with private helipads and airports when application aircraft will be flying over treatment sites.
- Employees of state and federal agencies monitoring the treatment will receive training on treatment methods to be able to answer questions from the public.
- Application of Btk will be suspended when school buses are in the site and when children are outside on school grounds.
- Aircraft will be calibrated for accurate application of treatment material.
- Applications will be timed so the most susceptible gypsy moth stage is targeted.
- Weather will be monitored during treatment to assure accurate deposition of the treatment material.
- The wind speeds during the application will be monitored by IDNR personnel and the aerial applicator will maintain the application within the boundaries of the proposed treatment site.
- Treatment will be avoided or stopped if winds are above the guidelines stated in the Work and Safety Plan.
- Aerial application of mating disruption over the Tippecanoe River in Fulton County will be adjusted so that flight lines minimize direct application as much as possible.

Monitoring

During the treatments, ground observers and/or aerial observers will monitor the application for accuracy within the site boundaries, swath width, and drift. Application information (e.g. swath widths, spray-on and spray-off, acres treated, and altitude) will be downloaded to an operations-base computer.

The treatment sites will be monitored, post-treatment, to determine the effectiveness of the treatments.

Executive Orders

Executive Order #12898
Consistent with this Executive Order, the USFS considered the potential for disproportionately high and adverse human health or environmental effects on any minority or low-income populations. The proposed treatment sites have been determined based on gypsy moth finds using STS protocols. The proposed treatment itself will have minimal effects, and it will not have disproportionate effects to any minority or low-income population.

5.0 LIST OF PREPARERS

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